RICKARD

INTELLIGENT COMFORT CONTROL

3

# ELECTRONIC VARIABLE VOLUME SWIRL DIFFUSER

## VSW/VRW1

- EXCELLENT MIXING
- HIGH INDUCTION RATES
- ACCURATE ONBOARD SENSING
- EXCELLENT THROW & FLOW
- LOW PRESSURE LOSS
- LOW NOISE
- NO MAINTENANCE
- 2 YEAR WARRANTY

## FEATURES

Rickard VAV Diffusers control Room Temperature by adjusting the volume of air very close to the swirl diffusers outlet. By changing the diffusers exit geometry, Coanda, Air Velocity and Throw is maintained at minimum and maximum volume. This technology prevents cold air from dumping at minimum, ensures excellent ventilation, air mixing, Air Change Effectiveness (ACE) and therefore thermal comfort (ADPI). Rickard VAV Swirl diffusers reduce pressure loss in the system due to their aerodynamic design and the absence of restrictions in the duct work.

### *PERFORMANCE*

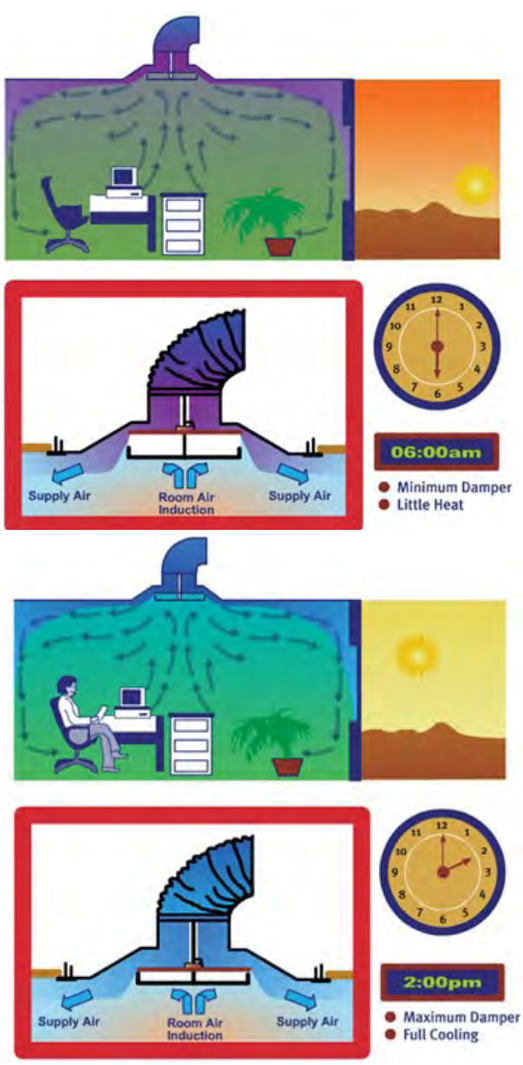
Swirl diffusion pattern creates excellent mixing.

Rickard VAV Swirl Diffusers control Room Temperature by adjusting the volume of air at the diffuser outlet.

By positioning the damper close to the outlet and using an aerodynamically shaped back-pan instead of a plenum the diffusers exit geometry, Coanda, Air Velocity and Throw is maintained at minimum and maximum volume.

This technology prevents cold air from dumping at minimum, ensures excellent ventilation, air mixing, Air Change Effectiveness (ACE) and therefore thermal comfort (ADPI).

Rickard VAV Swirl diffusers reduce pressure loss in the system due to their aerodynamic design and the absence of restrictions in the duct work.



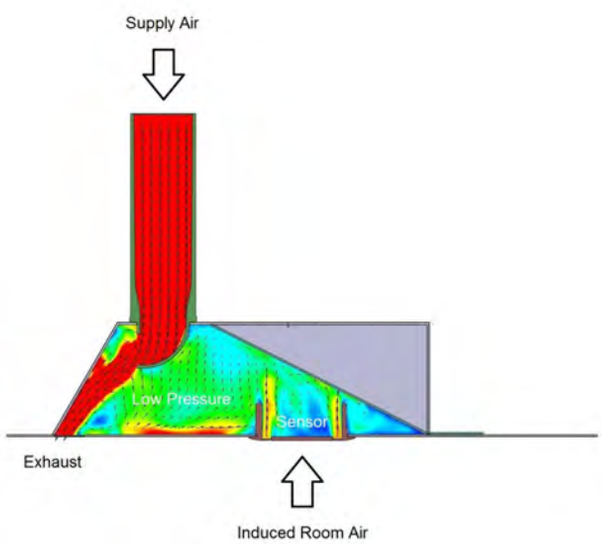

### *ENERGY SAVINGS*

***Green Building Benefits.*** Receive Management, Indoor Environmental Quality and Energy Efficiency Credits by using Rickard VAV Diffusers.

Rickard MLM controls use energy efficiently. Rickard MLM Diffusers use - 2.4VA (24VDC 100mA) only when the motor is running. MLM24 Power Supply Units use – 40VA (220VAC .2A) or (115VAC .35A) max and can supply up to 15 diffusers. MLM Master Communications Units (MCU2) use – 10VA (24VAC .4A) max and can connect to 60 diffusers.

### *SENSING ACCURACY*

Rickard Swirl Diffusers use innovative forced induction technology resulting in accurate room sensing and flexible zoning.




### *CONTROLS*

Master/Slave changes are achieved by installing an on-board controller or a wall thermostat controller that is activated using Rickard's Free Software.

| *SENSING OPTIONS* | *SENSOR POPULATED* | *UPGRADEABLE* |
|---|---|---|
| On-board Master | On-board Sensor | Wall thermostat |
| Master ready Slave | None | On-board/ Wall thermostat |
| Dedicated Slave | None | Wall thermostat |

Electronically adjustable maximum and minimum control disc limits allow designed airflow volumes to be achieved.

Global manual commands (all diffusers can be driven open) reduce commissioning costs. Cost effective standalone, LonWorks and BACnet BMS integration.

### *INSTALLATION SAVINGS*

Included plastic packaging can be used to protect the Diffuser once installed.

### *CAPITAL & OPERATING COST*

Low diffuser height (125mm) can reduce a buildings overall cost by reducing the height of the ceiling void.

### *AESTHETICS*

Available in Round (VRW) for skimmed ceilings and Square (VSW) for drop-in ceiling Tee applications. High Quality Epoxy Powder Coated Finish available in a wide range of colours. Matt White comes as standard.

### *MAINTENANCE*

No regular maintenance is required.

Diffuser life cycle testing gives peace of mind far beyond our two year warranty period (Electronic diffuser range). Life cycle testing is based on 3000 operating hours and 4000 control cycles per year and is the equivalent of 30 years of service.

### *WARRANTY*

Rickard offers a 2 year manufacturer's warranty on it's Electronic VAV swirl diffusers. Please see Terms and Conditions below for a full description of our warranty.

## *APPLICATION*

### *VAV COOLING AND HEATING*

### *VAV COOLING WITH TERMINAL REHEAT*

The RICKARD VARIABLE GEOMETRY SWIRL DIFFUSER is designed for general building zones where uniform swirl discharge is the most suitable and desirable supply air distribution pattern. The basic diffuser is available in a wide range of options to suit every individual requirement.
Optimum performance in terms of uniform air distribution and low noise levels have been combined with simple construction and aesthetically pleasing appearance to provide a unit which is both functional and reliable. All diffusers are of steel construction and are finished in a chip resistant baked epoxy coating which is available in a wide range of colours to suit architectural requirements.

## *OPERATION*

Volume control is achieved by moving a disc, known as a control disc, vertically up and down within the swirl diffuser. The aperture through which the air passes is adjusted very close to the swirls outlet. This is what constitutes the "VARIABLE GEOMETRY" concept. By directing air through the inside third of the swirl plate at minimum and using the entire swirl plate area at maximum, Air Velocity and Throw is maintained throughout the control range.
The position of the control disc is varied by means of an electric actuator which drives the control disc in response to a signal received from a temperature controller. When used in conjunction with one of the RICKARD controllers, the diffuser will control room temperature on a proportional/integral basis. Air is discharged in a horizontal 360º swirl pattern. Used in conjunction with our MLM controls, maximum and minimum supply air volumes may be adjusted to suit the particular design conditions. Diffusers are factory set to deliver 30% volume at the motors minimum position. Please note that the relationship between percentage motor position and percentage volume flow is not perfectly linear.

This Intelligent VAV technology combined with the swirls flow pattern, prevents cold air from dumping at minimum, ensures excellent ventilation, air mixing, Air Change Effectiveness (ACE) and therefore thermal comfort (ADPI). Rickard VAV Swirl diffusers reduce pressure loss in the system due to their aerodynamic design and the absence of restrictions in the duct work.

## *SELECTION*

The first consideration when designing a system is to calculate the required supply air volume and temperature to satisfy room conditions at maximum heat loads. It is recommended that ducting is sized using static regain design principles. Supply air velocities in branch ducts should be between 3.5 and 7m/s (650 and 1500ft/min).

### *THROW*

This is the distance from the centre of the diffuser to the point at which the supply air velocity has reduced to 0.25m/s (50ft/min) when measured 25mm (1 inch) below the ceiling and the control disc is in the fully open position. Coning occurs when two airstreams travelling in opposite directions meet and result in a downward moving cone of air. A similar effect is experienced should a diffuser be positioned at a distance from the wall that is less than its throw. The air will strike the wall and flow in a downward direction such that the point at which the air reaches a velocity of 0.25m/s (50ft/min), the sum of the horizontal and vertical travel of the air is equal to the diffuser throw. Throw remains at acceptable levels throughout the range of air flows, a feature of the variable geometry VAV diffuser concept.

### *NOISE LEVEL REQUIREMENTS*

The published diffuser noise level must be checked to ensure it is within the project specification. Published diffuser noise levels represent only the noise generated by the diffuser and do not take into consideration any duct-borne noise.

### *DUCT STATIC PRESSURE*

Diffuser performance has been established using diffuser neck TOTAL pressure, although that which is normally known or measured is duct STATIC pressure. What happens between the duct and the diffuser depends on the length and type of flexible duct being used. For simplicity, it can be assumed that the duct STATIC pressure is approximately equal to the diffuser neck total pressure. This is a valid assumption for systems where flexible duct lengths are not excessive and can be explained briefly as follows:

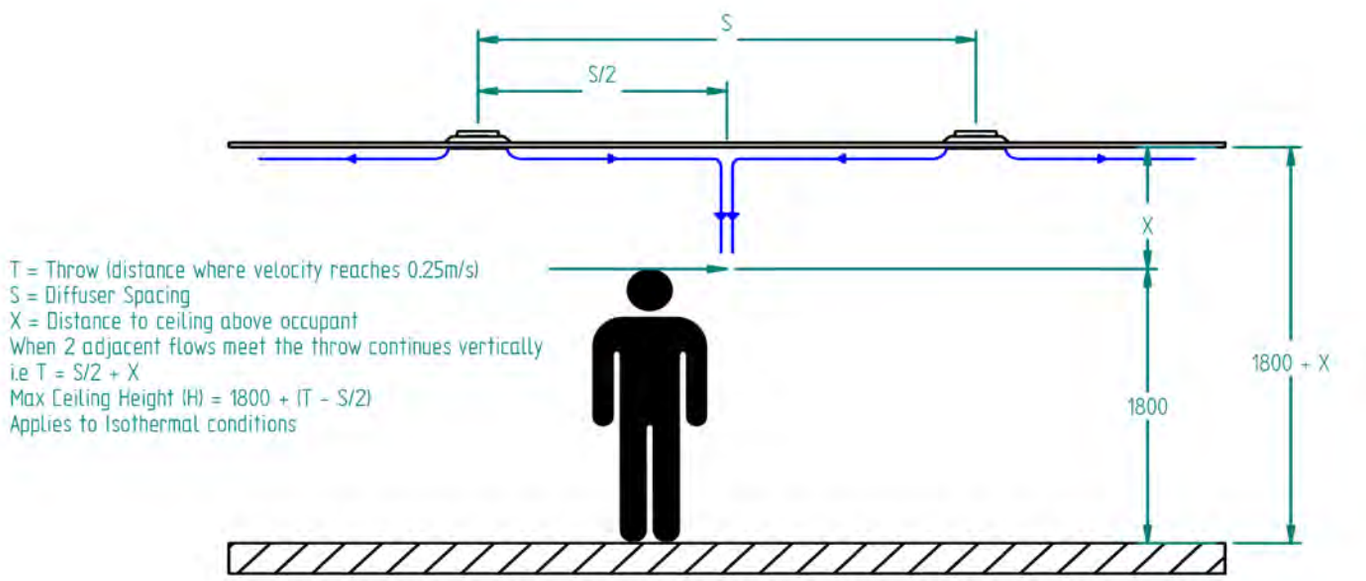
The static pressure loss due to friction in the flexible duct (±10Pa or 0.04ins wg) would normally be about the same as the velocity pressure in the neck of the diffuser and since total pressure is the sum of static and velocity pressure, we can say that neck total pressure is numerically approximately the same as duct static pressure. Although the tables reflect diffuser performance for neck total pressures ranging from 20-100Pa (0.04-0.40ins wg), caution should be exercised when selecting diffusers outside the 40-80Pa (0.08-0.32ins wg). At lower pressures air movement and induction may be insufficient and at higher pressures draughts and excessive noise may result. Best results are obtained when diffusers are selected at pressures of 50-70Pa (0.20-0.28ins wg). Bear in mind that all diffusers served by a common duct will all operate at the same static pressure as controlled by the pressure control damper. Therefore diffusers which are able to supply more air than is necessary will be driven partially closed by the temperature controller and hence the system becomes self-balancing.

***NOTE:*** Avoid upstream restrictions such as manually adjusted dampers or squashed flexible ducting. The reason being that at maximum flow any restriction will result in a significant static pressure loss (which for some cases may be desirable) whereas at minimum flow conditions offer virtually no restriction, which will result in the static pressure at the diffuser being too high at minimum flow conditions causing over-cooling/heating.

### *DETERMINING MAXIMUM CEILING HEIGHT*

The drawing below describes how to determine the maximum ceiling height that can be achieved from a diffuser. Please see the diffuser performance data page for airflow, throw, noise and pressure information.

***DETERMINING MAXIMUM CEILING HEIGHT***




## *OPTIONS*

**CONTROLS**

- MLM (Multi-loop Modular Controls)
- ML (Multi-loop Controls)

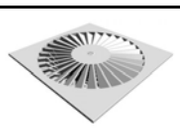
**REVERSING CHANGEOVER FOR HEATING AND COOLING MODES (MLM & ML)**

**ELECTRIC HEATING (MLM & ML):** Modular re-heaters can be added to a diffuser to supply spot heating in cold zones that aren't satisfied by the supply air.

## *TYPES*

### *STYLES*

Electronic VAV Swirl Diffusers are available as VSW's or VRW's. Please see the following Swirl Diffuser Mounting Section for full description for different mounting methods available.

| *VSW 150 to 300mm S595 & 603mm* | *VRW 150 to 300mm S595 & 603mm* |
|---|---|
|  |  |

### *SENSING OPTIONS*

Electronic VAV Swirl Diffusers are available with the following sensing options:

| *SENSING* | *SENSOR* | *UPGRADEABLE* |
|---|---|---|
| On-board Master | On-board Sensor | Wall thermostat |
| Master ready Slave | None | On-board/ Wall thermostat |
| Dedicated Slave | None | Wall thermostat |

**DIFFUSER SENSING/CONTROLLER OPTIONS (MLM & ML)**

- Wall thermostat/controller
- On-board controller
- On-board controller with infra-red remote set point adjuster

**INFRA-RED REMOTE SET POINT ADJUSTER (MLM & ML)**

**AIRFLOW MEASUREMENT (MLM ONLY):** Electronic commissioning and minimum and maximum airflow limits for the life of the system.

**OCCUPANCY SENSING (MLM ONLY):** Save fan energy by closing the diffuser when a zone is unoccupied.

**LIGHTS SWITCHING (MLM ONLY):** Use the existing MLM Controls system with Occupancy Sensing to switch off the lights when a zone is unoccupied.

### *OTHER*

**JUBILEE CLAMP:** Saves time and material when attaching the flex.

**VARIOUS CEILING DIFFUSER MOUNTING STYLES AVAILABLE:** See Ceiling Diffuser Mounting Methods in this Catalogue Section.

**BLANKING PLATES:** 90, 180 or 270 degree Blanking Plates.

| VSW1 & VRW1 | | | | | | |
|---|---|---|---|---|---|---|
| SIZE | READING | NECK TOTAL PRESSURE (Pa) | | | | |
| | | 30 | 40 | 50 | 60 | 70 |
| 150 | FLOW l/s | 68 | 79 | 88 | 96 | 104 |
| | THROW m | 1.8 | 2.1 | 2.3 | 2.5 | 2.7 |
| | NC LEVEL | 27 | 29 | 31 | 33 | 35 |
| 200 | FLOW l/s | 112 | 130 | 145 | 159 | 172 |
| | THROW m | 2.2 | 2.5 | 2.8 | 3.1 | 3.3 |
| | NC LEVEL | 28 | 31 | 33 | 35 | 37 |
| 250 | FLOW l/s | 159 | 183 | 205 | 225 | 243 |
| | THROW m | 2.9 | 3.3 | 3.7 | 4.1 | 4.4 |
| | NC LEVEL | 29 | 33 | 35 | 37 | 39 |
| 300 | FLOW l/s | 194 | 224 | 250 | 274 | 296 |
| | THROW m | 2.9 | 3.3 | 3.7 | 4.1 | 4.4 |
| | NC LEVEL | 30 | 33 | 36 | 38 | 40 |

Throw is measured with the diffusers control disc fully open, 25mm below the ceiling following a line through the centre of the diffuser at the point at which the airs velocity reaches 0.25m/s.

Noise Criteria levels apply to a single diffuser mounted in a room having a Sound Absorption of 10dB in octave bands having centre frequencies from 125Hz to 8000Hz (i.e. the difference between Sound Pressure Level (dB re:2 x $10^{-5}$ Pa) and Sound Power Level (dBW re: $10^{-12}$ watts) is equal to 10dB). These levels represent only the noise generated by the diffuser and do not take into account any duct-borne noise.

Diffusers are shipped fully open.

Performance Data applies to Standard Air having a density of 1.2 kg/m3.

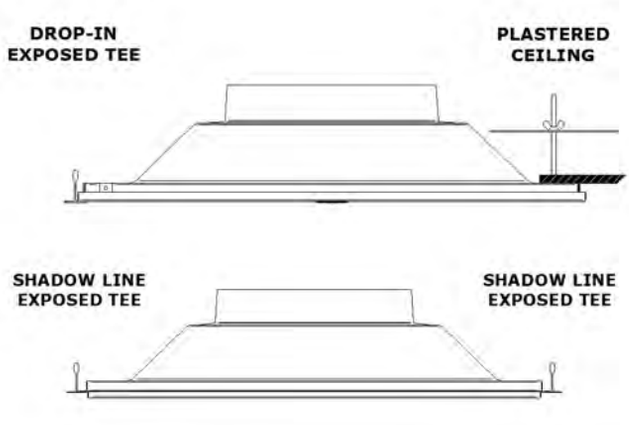
## OPTIONS

The Rickard Swirl Diffuser Range supports a wide range of diffusion unit styles.

### EXPOSED TEE CEILING GRID

1. SQUARE SWIRL DIFFUSER
   - i. Drop-in Flush Mounting
   - ii. Drop-in Shadow Line

The standard swirl drops into a square opening between ceiling tees. Flush Mounting and Shadow Line styles are available. These can be supplied with the following mounting plate sizes, 595x595mm & 23¾ x23¾" to suit 600x600mm & 24x24" ceiling grids respectively. Specials sizes are available on request.




### BAFFLED CEILING

1. SQUARE SWIRL
   - i. 4 Point Fixing (4 Brackets for threaded rod connection)
2. ROUND DIFFUSER
   - i. 3 Point Fixing (3 Brackets for threaded rod connection)
   - ii. Hard Duct Connection (no accessories required)

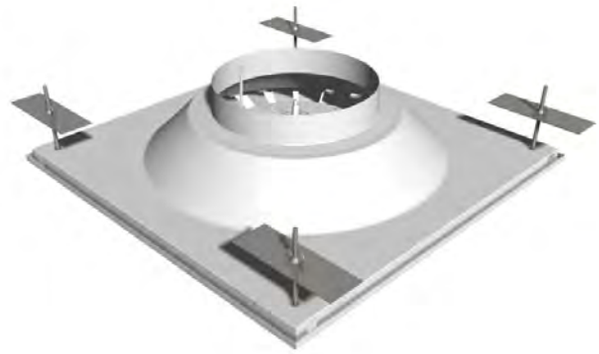
Baffled ceilings require an unusual treatment which is not illustrated. Normally this ceiling requires a square tile with suspension points fitted at each corner thereby enabling support from the top edges of the baffles. Large diffuser mounting plates are particularly beneficial in the baffled ceiling as there is otherwise little opportunity for the Coanda effect to help distribute conditioned air across the ceiling. This may result in inadequate throws and poor room air movement.

### PLASTERED CEILING

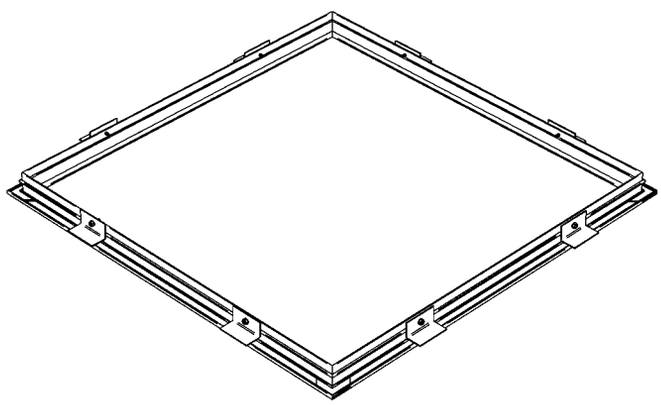
1. SQUARE SWIRL
   - i. 4 Point Fixing (4 Brackets with Backing Plates)
   - ii. T-Frame (To allow Drop-in Flush Mounting)

In the case of mounting square diffusers into plastered ceilings, two methods of fixing may be used. Concealed fixing is achieved by four fixing studs secured in the corners of the mounting plate. These pass through the ceiling and, with the use of backing plates, are used to secure the diffuser to the ceiling. A further option for fixing into a plastered ceiling is with the use of a T-frame which is an optional extra. This is fixed to the ceiling and the diffuser then drops into it.

***4 POINT FIXING (4 BRACKETS WITH BACKING PLATES)***



***T-FRAME (DROP-IN MOUNTING FOR PLASTERED CEILINGS)***

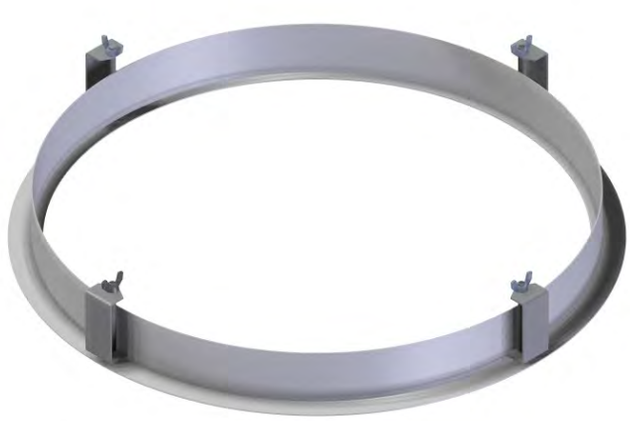


2. ROUND DIFFUSER
   - i. T-Ring (Frame to allow Drop-in Flush Mounting)

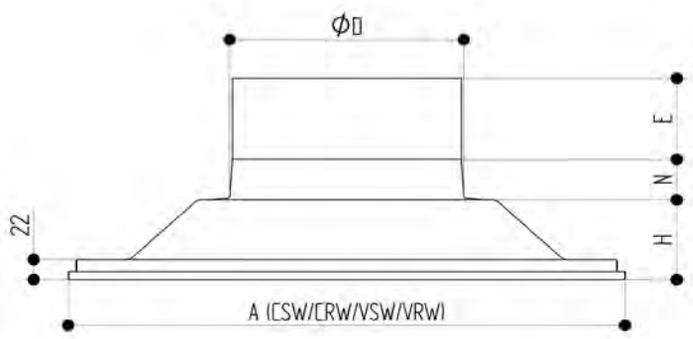
Apart from the usual four-corner style, the Rickard Swirl Diffuser is also available in a circular format. This model is most often combined with round down-lighters to preserve the circular pattern, and in particular with plastered ceilings. It also offers the absolute minimum interruption to the ceiling for those who prefer to have its unbroken regularity maintained.

Fixing of round diffusers in a plastered ceiling often presents a problem because of restricted access to the ceiling void. This problem is overcome with a T-Ring to allow Drop-in Flush Mounting of a standard Round Swirl Diffuser. The T-Ring is mounted flush with the ceiling after a round hole with a diameter of 590-600mm is cut into the plaster board. Four threaded brackets draw the T-Ring flush against the ceiling to ensure a neat finish.

***T-RING (DROP-IN MOUNTING FOR PLASTERED CEILINGS)***



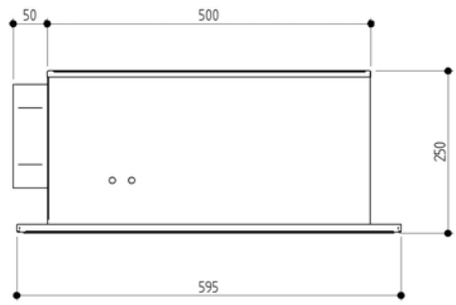
***SWIRL DIFFUSER GENERAL DIMENSIONS***

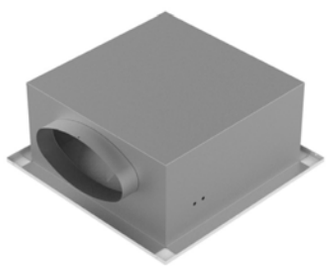



| Nominal Size | Dimensions (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Ø D | A | H | N | Ø R | E | | |
| 150 | 153 | 595 x 595 | 95 | 28 | 580 | Heater Neck 90 | Airflow Sensor 115 | Airflow Switch 125 |
| 200 | 200 | 595 x 595 | 92 | 33 | | | | |
| 250 | 250 | 595 x 595 | 89 | 34 | | | | |
| 300 | 293 | 595 x 595 | 86 | 35 | | | | |

***SWIRL DIFFUSER WITH PLENUM GENERAL DIMENSIONS***

(Use when ceiling space is limited)



**Note:** Plenums create a significant pressure drop

(Performance data will not apply)

| Swirl Diffuser Style | | | **Swirl Diffuser Mounting Types** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Exposed Tee | | Baffled Ceiling | | Plastered Ceiling Surface Mounting | | |
| Model | Swirl Diffuser Shape | Swirl Diffuser Size | Drop-in Flush Mounting | Drop-in Shadow Line | 4 Point Fixing Brackets | 3 Point Fixing Brackets | 4 Point Fixing & Backing Plate | T-Frame | T-Ring |
| CSW3 or VSW1 | Square | 595x595 | • | • | • | o | • | • | o |
| | Square | 23¾"x23¾" | • | • | • | o | • | • | o |
| CRW3 or VRW1 | Round | 580 | o | o | o | • | o | o | • |

***GENERAL***

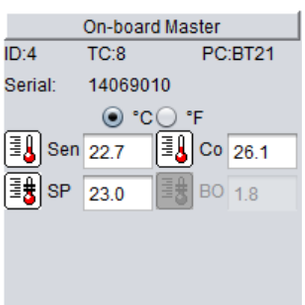
The RICKARD Reversing Changeover facility ensures that the VAV diffuser controls the temperature accurately when the central system is supplying either warm or cold air.

***OPERATION***

When the system switches from cooling to heating, the changeover sensor detects the increase in supply air temperature and switches the direction in which the actuator operates. This means that when the system is in cooling mode, the diffuser will drive open as the room temperature increases, whereas in the heating mode the diffuser will close as the room temperature increases.

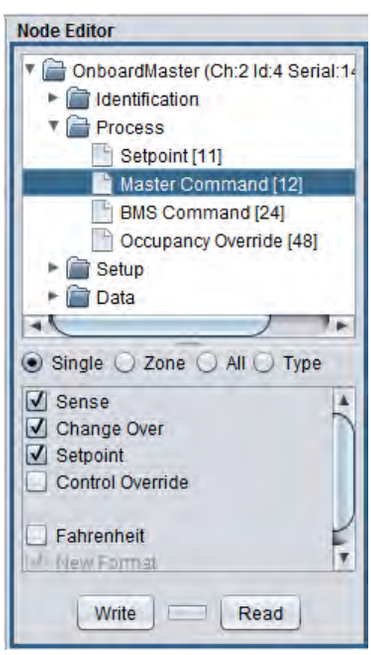
***INSTALLATION***

Converting a standard RICKARD master diffuser to incorporate changeover functionality is as simple as plugging in the supply air/ changeover temperature sensor and activating it using the software. Every master controller is pre-activated. This temperature sensor must be fitted in such a way that it senses the primary air temperature being supplied to the diffuser.

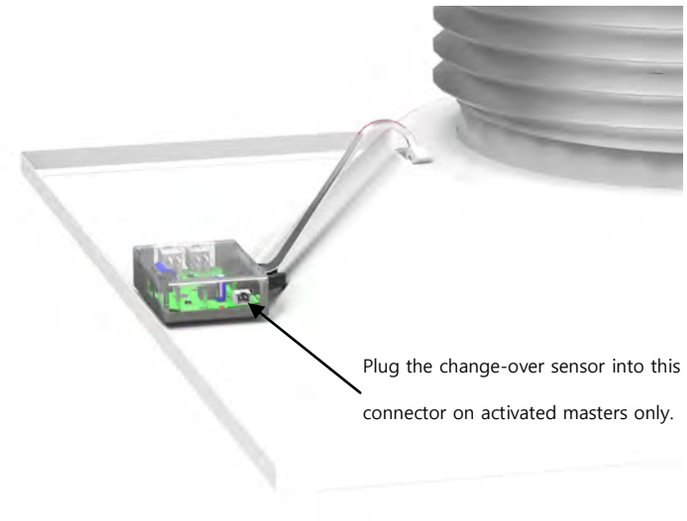



**TYPICAL MASTER SETTINGS**

Change-over sensing, room sensing and set-point is activated.

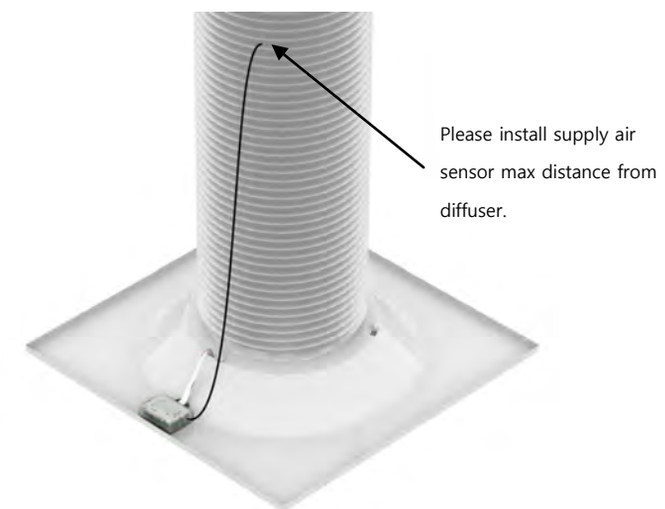



**NOTE:** Slave diffusers receive a control signal from the master diffuser and therefore do not require nor should they be fitted with a changeover sensor. It is also important that a slaves changeover sensing is turned off on the MLM application. Failure to do so will result in a zone not operating correctly. Only one changeover sensor should be activated per zone i.e. the master.




*VCD1 Shown. Use the same connector on other models.*

If a re-heater is fitted to the neck of the diffuser, care must be taken to ensure that, the changeover sensor is installed in such a way that it is not affected by radiant heat from the heater. Every changeover sensor is labeled "Please install supply air sensor max distance from diffuser" to ensure this.




*VCD1 Shown. Always locate sensor away from heater when fitting to other models.*

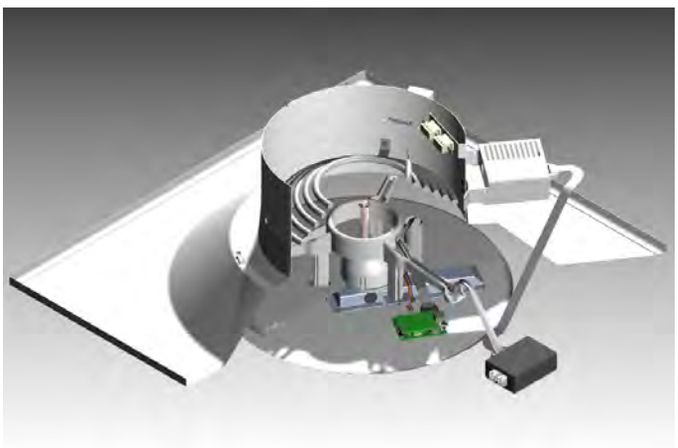
The controller compares the primary air and room temperature. Whenever the supply air temperature exceeds the room temperature by one degree Celsius, the control action is reversed and switches to heating mode. Cooling mode is re-instated when the primary air temperature falls one degree Celsius below room temperature.

***ENERGY EFFICIENCY***

Should a VAV air diffusion unit be fitted with a re-heater, the heater will be proportionally energized between 0.5°C and 1.5°C below set-point temperature, regardless of which mode the controller is in. Effectively, a re-heater will only be energized at Minimum Supply Air Status in the cooling mode and at Maximum Supply Air Status when in the heating mode. This control logic is extremely energy efficient from a Green Building perspective.

### *FORM FACTOR*

RICKARD ceiling diffusers may be fitted with electric re-heaters that are housed within a sleeve which slides into the diffuser neck. This applies to ceiling diffuser types VCD1, VSD1, CCD3, CSD3, VSW1 and CSW3's. The heaters are energised when additional heating is required in a room. Heaters fitted into WBD's and VLN's are not modular and are fitted to the diffusers casing or spigot respectively.

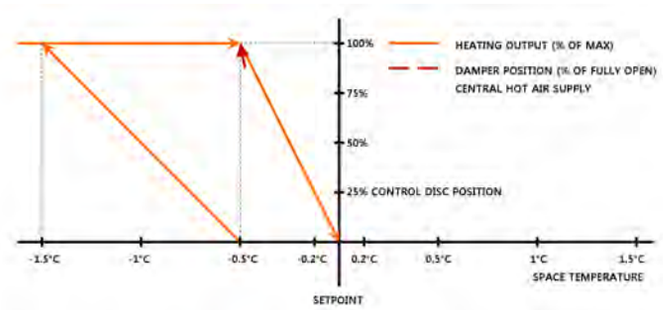


**VAV PLATE DIFFUSER FITTED WITH MODULAR HEATER SPIGOT**

**WBD WITH DEDICATED HEATER FITTED**

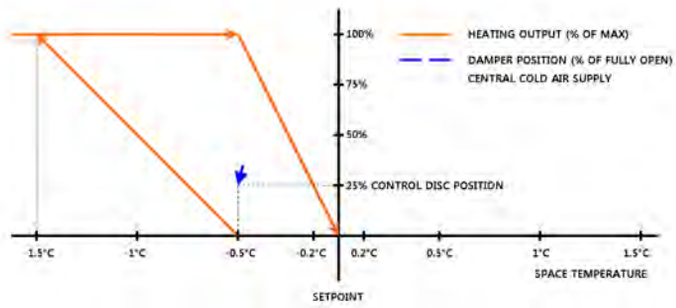
If used correctly, electric heating in VAV diffusers can be considered to be an energy saving device. By using them in offices that are typically colder than the building average allows the central plant to produce less heating in winter than is otherwise possible.

The most efficient scenario in heating is for the central plant to supply sufficient heated air to allow most of the zones to be in control when the diffusers damper is close to minimum position. Zones that are colder are controlled by the diffuser opening further. Zones that cannot be satisfied by the diffuser supplying warm air at full volume are toped up with supplementary heating.




The most efficient scenario in cooling is for the central plant to supply sufficient cool air to allow most of the zones to be in control when the diffuser dampers are close to minimum position. Zones that are warmer can be controlled by the diffuser opening further. Zones that cannot be warmed sufficiently by reducing the cold air supply can be controlled by heating this reduced volume of air.

If the room temperature were to fall by 0.5°C below set point, the Triac Controller will commence energizing the heater proportionally and will fully energize the heater when the room temperature is approximately 1.5°C below set point.




Integration of the Rickard VAV diffuser system with the central plant BMS is possible by using our MLM Interoperable BMS Compatible Controls.

### *PROPORTIONAL HEATING*

For accurate control of room temperature, the electric re-heater is controlled on a step-less, proportional basis. In addition to having a proportional output signal for cooling control, the temperature controller also has a proportional output signal for heating.

This is done by means of a triac switching set (current valve) which varies the heater output capacity by cycling the power supply to the heater on and off – Pulse Width Modulation (PWM). This switching takes place over a cycle of approximately 2 seconds and always occurs at zero voltage to avoid radio frequency interference and voltage spikes. The "on" and "off" periods are varied in proportion to the amount of heating required, i.e. a required heating capacity of 75% will result in an "on" period of 1.5 seconds and an "off" period of 0.5 seconds.

### *CONTROLS*

In a situation where multiple diffusers are controlled from a single controller, each diffuser will be fitted with its own triac that will receive a heating signal from the Master controller. The heating signal transmitted by the controller is a 9 Volt DC signal.

From the table "Maximum Recommended Heater Output (Watts)", it will be noted that for each neck total pressure there is a specific heater output quoted and for each diffuser size a standard heater capacity is referenced. For example, in the case of a VCD 250 diffuser, the re-heater sleeve would be factory fitted with a 1500 watt heater, which by utilizing the RICKARD MLM or MLM Interoperable BMS Compatible Controls, can be electronically set for any output from as little as 100 watts to 1500 watts to match the design engineer's requirements for minimum cooling mode supply air flow and desired leaving air temperature. Therefore, if the diffuser neck total pressure were to be set at 50Pa and the minimum desired air flow was 30% of maximum with 17°C air temperature rise, the heater output for a VCD 250 should be set to 1350 watts. Kindly refer to the help section in the MLM software program for more detailed information.

**IMPORTANT ELECTRICAL INFORMATION:** Electrical reticulation should be designed to have the capacity to manage the heaters full capacity e.g. when a heater is set to 50%, the heater element draws the same current as it would when set to 100% but it is drawn for 50% of the time.

### *SELECTION GUIDELINES*

When calculating heater capacities for VAV diffusers, please keep in mind that heating in the cooling mode takes place when the diffuser is supplying minimum air flow and care must therefore be taken to ensure that an excessive temperature rise in the diffuser is avoided. Discharge temperatures in excess of 32°C are likely to cause stratification within the room. As a guide-line, the temperature of the air leaving the diffuser should not be more than 10°C above actual room temperature. Kindly refer to the appropriate products table giving the "Maximum Recommended Heater Output (Watts)" on page 3 for each diffuser size. These heater output ratings have been computed on the basis that minimum air flow is 30% of maximum and the maximum capacity of the fitted re-heater are set electronically for an air temperature rise of no more than 17°C, a standard feature of the RICKARD MLM and Interoperable BMS Compatible Controls.

IMPORTANT: These maximum capacities do not take into account limitations of the triac which are rated at 12A maximum. This reduces the capacity of the triac at low voltage supply.

### *ELECTRICAL AND OVERHEAT SAFETIES*

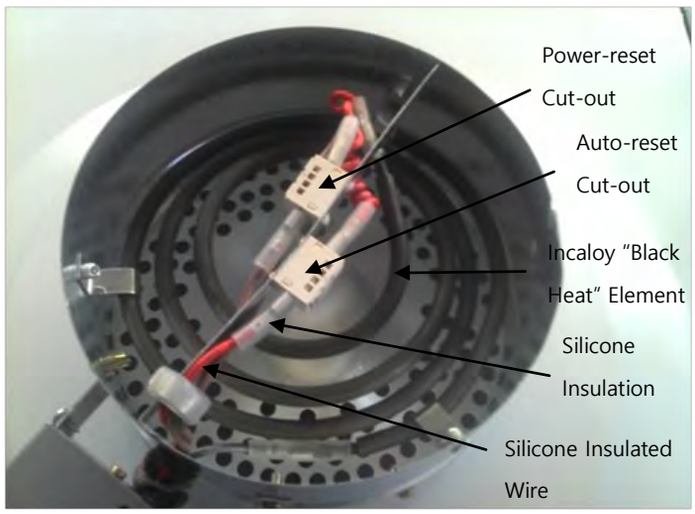
Every Heater Module is fitted with a coiled Electrical Element inside a Mill Galvanised Sheet metal enclosure. The Heater Elements are "black heat" having a heat density of 3.2W/cm² and are constructed from an Incaloy material that does not glow red when energised. This element is selected to reduce the risk of combustible materials igniting should they come into contact with the heater element itself. No combustible materials are used in the construction of a Rickard Diffuser or Heater Module. Rickard uses a high spec flame retardant, self extinguishing polycarbonate plastic that is chlorine and bromine free and has a UL94 V-0 rating at 1.5mm in its ceiling diffusers. The Heater modules are fitted with their own Triac or Heater driver and receive a proportional signal from the diffuser controls when additional heating is required to bring the room into control. The Triac receives its power from a seperate power circuit. Dedicated plug tops can be fitted to the heater module on request.

The Heater Modules Triacs are fitted with a number of safeties to reduce the risk of failure. The Triac is fitted inside an electrically grounded metal enclosure that is physically attached to the Heater module Enclosure. This safety increases the electrical safety of the device should a short circuit occur. A fuse offers additional protection against large current surges and shorts. A Transient suppressor prevents the Triac from failing closed and therefore driving the heater permanently after a voltage surge has occurred.

In all cases an auto-reset 65°±5°C (10 000 cycles) and power-reset 85°C±5°C (300 cycles) overheat safety cut-out is fitted as standard. The reset temperatures indicate the air temperature inside the overheat safety cut-out casing at which it operates. Rickard heater modules are designed so that the overheat safety cut-outs trigger when the neck Total pressure is 30Pa or below. The trigger point can vary depending on a number of factors namely, excessively squashed or bent flex, neck size, heater size and damper position. Rickard controls do not activate its heaters below 20% flow damper position, thereby reducing the likelihood of the overheat safeties not triggering in the range described. The power reset cut-out is reset by turning the power supply off momentarily. If a power reset is required, an investigation into the cause should be made. Push-button type manual reset safeties are not recommended in conjunction with diffuser re-heaters.

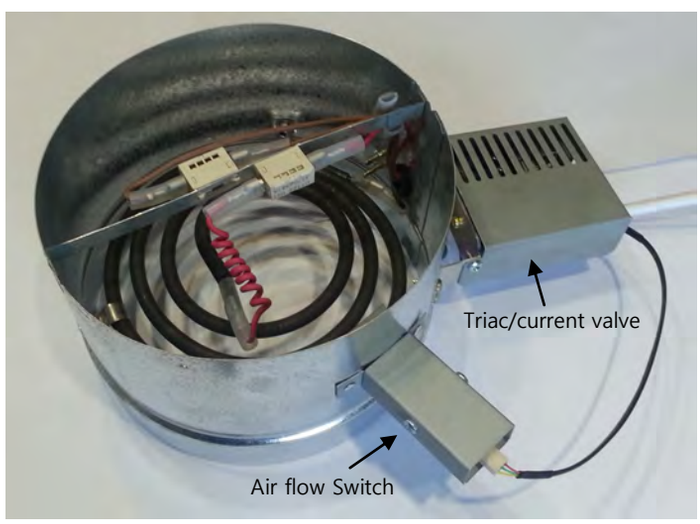
### *STANDARD SAFETIES FITTED TO ALL VAV DIFFUSER TYPES*

### *(VCD1, VSD1, CCD3, CSD3, VSW1, WBD's and VLN's )*




For additional safety, RICKARD offer an Airflow Switch to interrupt power to the re-heater controls when there is insufficient airflow across the heater element. The switch is calibrated to disable the heater current valve below a static pressure of 12Pa (+/- 5Pa). The switch operates as a dead man switch i.e. if the cable between the switch and the heater controls is unplugged, the heater will not operate.

### *OPTIONAL AIRFLOW CUT-OUT/SWITCH*




### *TESTING*

All electrical wiring associated with the re-heater is carried out in the factory and all units carefully tested for correct operation.

### *OPTIONS*

Heaters are available in various capacities, ranging from 0.5kW to 2.5kW.

For additional safety, RICKARD offer an Airflow Switch to interrupt power to the re-heater controls when there is insufficient airflow across the heater element.

**VCD**

Recommended Heater settings & sizing for a 15 Degree C Heat Rise @ 30% Open

| Pa | 20 | | | 30 | | | 40 | | | 50 | | | 60 | | | 70 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Neck Size (mm) | kW | | | kW | | | kW | | | kW | | | kW | | | kW | | |
| | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set |
| 150 | 0.35 | 0.50 | 70% | 0.34 | 0.50 | 68% | 0.50 | 0.50 | 100% | 0.50 | 0.50 | 100% | 0.60 | 0.75 | 80% | 0.65 | 0.75 | 87% |
| 200 | 0.60 | 0.75 | 80% | 0.70 | 0,75 | 93% | 0.75 | 0.75 | 100% | 0.90 | 1.00 | 90% | 1.00 | 1.00 | 100% | 1.00 | 1.00 | 100% |
| 250 | 0.85 | 1.00 | 85% | 1.00 | 1.00 | 100% | 1.15 | 1.25 | 92% | 1.30 | 1.50 | 87% | 1.40 | 1.50 | 93% | 1.50 | 1.50 | 100% |
| 300 | 1.00 | 1.00 | 100% | 1.25 | 1.25 | 100% | 1.50 | 1.50 | 100% | 1.65 | 2.00 | 83% | 1.75 | 2.00 | 88% | 2.00 | 2.00 | 100% |
| 350 | 1.30 | 1.50 | 87% | 1.50 | 1.50 | 100% | 1.85 | 2.00 | 93% | 1.85 | 2.00 | 93% | 2.25 | 2.50 | 90% | 2.50 | 2.50 | 100% |

**VSW**

Recommended Heater settings & sizing for a 15 Degree C Heat Rise @ 30% Open

| Pa | 30 | | | 40 | | | 50 | | | 60 | | | 70 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Neck Size (mm) | kW | | | kW | | | kW | | | kW | | | kW | | |
| | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set |
| 150 | 0,35 | 0,5 | 70% | 0,4 | 0,5 | 80% | 0,45 | 0,5 | 90% | 0,5 | 0,5 | 100% | 0,55 | 0,75 | 73% |
| 200 | 0,6 | 0,75 | 80% | 0,7 | 0,75 | 93% | 0,8 | 1 | 80% | 0,85 | 1 | 85% | 0,9 | 1 | 90% |
| 250 | 0,85 | 1 | 85% | 1 | 1,25 | 80% | 1,1 | 1,5 | 73% | 1,2 | 1,25 | 96% | 1,3 | 1,5 | 87% |
| 300 | 1 | 1 | 100% | 1,2 | 1,5 | 80% | 1,35 | 1,5 | 90% | 1,5 | 1,5 | 100% | 1,6 | 2 | 80% |

**VLN1 2 Slot Pattern C**

Recommended Heater settings & sizing for a 15 Degree C Heat Rise @ 30% Open

| Pa | 30 | | | 40 | | | 50 | | | 60 | | | 70 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length (mm) | kW | | | kW | | | kW | | | kW | | | kW | | |
| | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set |
| 600 | 0,3 | 0,5 | 60% | 0,35 | 0,5 | 70% | 0,35 | 0,5 | 70% | 0,4 | 0,5 | 80% | 0,45 | 0,5 | 90% |
| 900 | 0,45 | 0,5 | 90% | 0,55 | 0,55 | 100% | 0,6 | 0,75 | 80% | 0,65 | 0,75 | 87% | 0,7 | 0,75 | 93% |
| 1200 | 0,65 | 0,75 | 87% | 0,75 | 0,75 | 100% | 0,8 | 1 | 80% | 0,9 | 0,9 | 100% | 1 | 1 | 100% |
| 1500 | 0,85 | 0,85 | 100% | 1 | 1 | 100% | 1,1 | 1,25 | 88% | 1,2 | 1,2 | 100% | 1,3 | 1,5 | 87% |

**WBD**

Recommended Heater settings & sizing for a 15 Degree C Heat Rise @ 30% Open

| Pa | 20 | | | 30 | | | 40 | | | 50 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size (mm) | kW | | | kW | | | kW | | | kW | | |
| | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set |
| 300/100 | 0,4 | 0,5 | 80% | 0,5 | 0,5 | 100% | 0,55 | 0,75 | 73% | 0,6 | 0,75 | 80% |
| 350/100 | 0,55 | 0,75 | 73% | 0,65 | 0,75 | 87% | 0,7 | 0,75 | 93% | 0,75 | 0,75 | 100% |
| 400/100 | 0,6 | 0,75 | 80% | 0,75 | 0,75 | 100% | 0,8 | 1 | 80% | 0,9 | 1 | 90% |
| 450/100 | 0,7 | 0,75 | 93% | 0,8 | 1 | 80% | 0,9 | 1 | 90% | 1 | 1 | 100% |
| 500/100 | 0,7 | 0,75 | 93% | 0,85 | 1 | 85% | 0,95 | 1 | 95% | 1,1 | 1,25 | 88% |
| 550/100 | 0,75 | 0,75 | 100% | 0,95 | 1 | 95% | 1,1 | 1,25 | 88% | 1,2 | 1,25 | 96% |
| 600/100 | 0,9 | 1 | 90% | 1 | 1 | 100% | 1,2 | 1,25 | 96% | 1,25 | 1,25 | 100% |
| 650/100 | 0,95 | 1 | 95% | 1,15 | 1,25 | 92% | 1,25 | 1,25 | 100% | 1,45 | 1,5 | 97% |
| 500/150 | 1 | 1 | 100% | 1,25 | 1,25 | 100% | 1,6 | 2 | 80% | 1,8 | 2 | 90% |
| 550/150 | 1,2 | 1,25 | 96% | 1,4 | 1,5 | 93% | 1,65 | 2 | 83% | 1,85 | 2 | 93% |
| 600/150 | 1,4 | 1,5 | 93% | 1,6 | 2 | 80% | 1,9 | 2 | 95% | 2 | 2 | 100% |
| 650/150 | 1,4 | 1,5 | 93% | 1,7 | 2 | 85% | 2 | 2 | 100% | 2,2 | 2,5 | 88% |
| 700/150 | 1,5 | 1,5 | 100% | 1,85 | 2 | 93% | 2,2 | 2,5 | 88% | 2,4 | 2,5 | 96% |
| 800/150 | 1,75 | 2 | 88% | 2,1 | 2,5 | 84% | 2,5 | 2,5 | 100% | 2,5 | 2,5 | 100% |

**CCD**

Recommended Heater settings & sizing for a 10 Degree C Heat Rise @ 100% Open

| Pa | 20 | | | 30 | | | 40 | | | 50 | | | 60 | | | 70 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Neck Size | kW | | | kW | | | kW | | | kW | | | kW | | | kW | | |
| | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set |
| 150 | 1.30 | 1.50 | 87% | 1.50 | 1.50 | 60% | 1.75 | 2.00 | 88% | 2.00 | 2.00 | 100% | 2.25 | 2.50 | 90% | 2.40 | 2.50 | 96% |
| 200 | 1.80 | 2.00 | 90% | 2.25 | 2.50 | 90% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% |
| 250 | 2.30 | 2.50 | 92% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% |
| 300 | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% |

**CSW**

Recommended Heater settings & sizing for a 10 Degree C Heat Rise @ 100% Open

| Pa | 20 | | | 30 | | | 40 | | | 50 | | | 60 | | | 70 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Neck Size | kW | | | kW | | | kW | | | kW | | | kW | | | kW | | |
| | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set | Adjust | Fit | Set |
| 150 | 0.70 | 0.75 | 93% | 0.80 | 1.00 | 80% | 1.00 | 1.00 | 100% | 1.00 | 1.00 | 100% | 1.15 | 1.25 | 92% | 1.25 | 1.25 | 100% |
| 200 | 1.20 | 1.25 | 96% | 1.30 | 1.50 | 87% | 1.50 | 1.50 | 100% | 1.75 | 2.00 | 88% | 1.90 | 2.00 | 95% | 2.00 | 2.00 | 100% |
| 250 | 1.80 | 2.00 | 90% | 2.00 | 2.00 | 100% | 2.25 | 2.50 | 90% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% |
| 300 | 2.00 | 2.00 | 100% | 2.40 | 2.50 | 96% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% | 2.50 | 2.50 | 100% |

To limit stratification in heating Rickard recommends that the heater outputs be limited to the values published in the tables above. The calculated values will ensure that the heat rise is no more than 15°C in VAV diffusers and 10°C in CAV diffusers. Please note that these values are a guide and are calculated at 30% volume for VAV diffusers and 100% volume for CAV diffusers. By adjusting the diffuser damper position down, a smaller volume will create a larger heat rise and therefore increase the likelihood of stratification. The Fit column indicates the maximum fitted heater size recommended, the Adjust value indicates the maximum heater setting recommended to achieve a 15°C (VAV) or 10°C (CAV) heat rise and the Set column is the MLM Heater Output % value required to achieve a 15°C (VAV) or 10°C (CAV) heat rise.